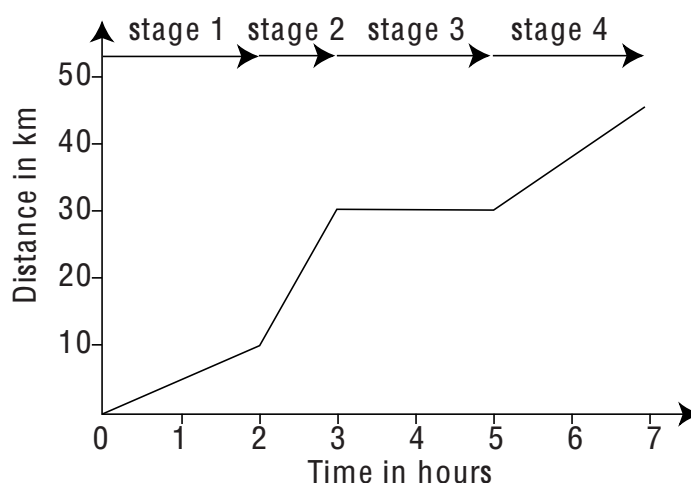


You can work out the speed of an object at each stage of its journey by plotting a graph of distance travelled against time. In this activity, you are going to use distance–time graphs to calculate speed.

The graph shows the journey made by a cyclist. It is possible to calculate the speed of the cyclist by finding how far he travelled over a period of time and using the equation for speed. For example, over the first 2 hours (**stage 1**) the cyclist travelled 10 km. This is a speed of $10 \text{ km} / 2 \text{ h} = 5 \text{ km/h}$.

Use this graph to answer Questions **1–6**.



- ① Calculate the speed between the second and third hours (**stage 2**).
- ② Calculate the speed between the fifth and seventh hours (**stage 4**).
- ③ What sort of line on a distance–time graph indicates a fast speed?
- ④ What sort of line on a distance–time graph indicates a slow speed?
- ⑤ At what time do you think the cyclist stopped to have lunch, and why?
- ⑥ What is the average speed for the whole journey?

Draw a distance–time graph on graph paper of the four cars **A–D** in this table.

| Car | Time in seconds | | | | |
|----------|--------------------|-----|-----|-----|------|
| | 0 | 10 | 20 | 30 | 40 |
| | Distance in metres | | | | |
| A | 0 | 200 | 400 | 600 | 800 |
| B | 0 | 400 | 800 | 900 | 1000 |
| C | 0 | 100 | 300 | 300 | 400 |
| D | 0 | 150 | 300 | 450 | 700 |

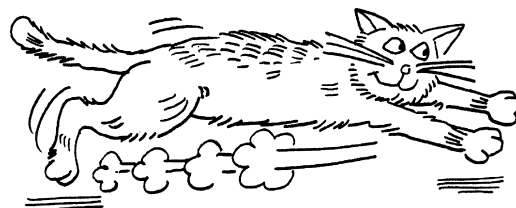
Use your graph to answer Questions **7–11**.

- ⑦ Which car stops for a time before starting again?
- ⑧ Which car travels at a constant speed?
- ⑨ Which car is slowing down?
- ⑩ Which car is travelling the fastest at 40 seconds?
- ⑪ All the cars start from the same point. If the shops are 4 000 metres from the starting point, and the cars travel at the same speed as they are travelling at the 40 seconds point on your graph, which car will get to the shops first?

The speed of an object can be found by using:

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

Use the equation above to calculate the speed in the following questions. Make sure you give units with your answers.



① Calculate the speed of the following animals:

- a cat that runs 20 metres in 2 seconds
- a dog that walks 40 metres in 8 seconds
- a kangaroo that jumps 800 metres in 10 seconds.

② At the school sports day, Mark runs the 100 m in 10 s while James runs the 200 m in 25 s. Who was faster?

③ Calculate the speed of each train in the table below. Which one is travelling the fastest?

| | Train A | Train B | Train C |
|-------------------|--------------------------|----------------------|------------------------|
| Journey | From Liverpool to London | From Leeds to London | From Ashford to London |
| Distance | 240 km | 200 km | 60 km |
| Time taken | 3 hours | 2 hours | 1.5 hours |

④ A plane travels from Vienna to London, a distance of 800 km, in 75 minutes. Calculate the speed of the plane.

